Mars Scout 2006
and
Missions of Opportunity

Preproposal Conference

Technical, Management, and Cost (TMC) Evaluation

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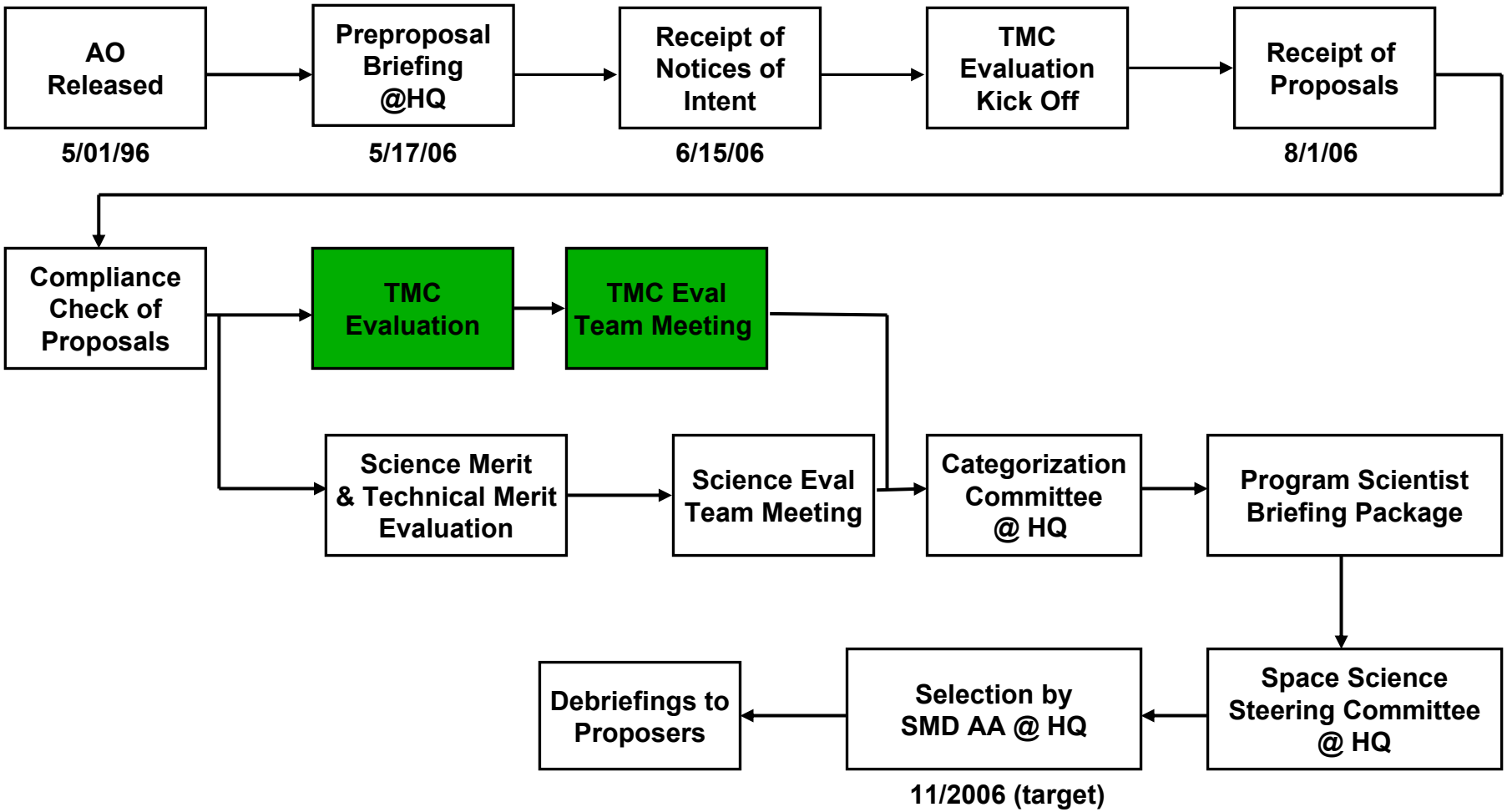
Mars Scout Proposal Evaluation Process



Feasibility of the Mission Implementation, Including Cost Risk

• The Feasibility of the Mission Implementation, Including Cost Risk is an Evaluation Criteria weighted 30% in this phase and is a Selection Factor (Section 8.2.1)
•The Technical, Management, and Cost (TMC) panel will evaluate proposals against the evaluation criteria in section 8.2.4 of the AO titled Feasibility of the Mission Implementation, Including Cost Risk

"The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be implemented as proposed, including an assessment of the risk of their completion within the proposed costs. Missions are encouraged to propose well below the cost cap, to permit greater flexibility and robustness in the Project and the MEP. The evaluation will consider implementation factors such as the proposed launch vehicle (including reliability); overall mission design (i.e., "mission architecture"); spacecraft design and design margins; and the proposers' understanding of the processes, products, and activities required to accomplish development and integration of all elements (flight systems, ground and data systems, etc.). This assessment will also consider cost and cost risk, the adequacy of the proposed organizational structure, the roles and experience of the partners, the management approach, the subcontracting plan, the implementing organization's past performance, the commitments of partners and contributors, and the team's understanding of the scope of work (covering all elements of the mission, including contributions). The relationship of the work to the project schedule, the project element interdependencies, and associated schedule margins will also be evaluated. Investigations proposing new technology, i.e., technologies having a Technology Readiness Level (TRL) less than 6 (see *TRL Definitions* in the Mars Scout Library), will be penalized for risk if adequate backup plans to ensure success of the mission are not described."
Section 8.2.4

Feasibility of the Mission Implementation, Including Cost Risk

"The proposal must discuss the methods and rationale (cost models, cost estimating relationships of analogous missions, etc.) used to develop the estimated cost and must include a discussion of cost risks. The MEP has become increasingly aware of the risks and Program-level impacts associated with cost overruns. The proposer should address the uncertainties in the baseline cost estimate by attributing a confidence level, and showing high and low cost values around the baseline appropriate to the level of uncertainty. The baseline cost is required to be compliant with the cost cap. Innovative, cost-effective features, processes, or approaches will be considered a strength if proven sound.

Student Collaboration proposals, if any, will be evaluated for overall merit and will not be penalized for any inherent higher cost, schedule, or technical risk, as long as the SC is shown to be clearly separable from the primary objectives per Section 6.8.

Feasibility of the Mission Implementation, Including Cost Risk

"Proposals must also define the risk-management approach the project team intends to use to ensure successful achievement of the investigation objectives within established resource and schedule constraints. Risk-mitigation plans for new technologies and the need for long-lead items that must be placed on contract before the beginning of Phase C to ensure timely delivery should be included in this discussion of risk management. Additionally, any manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation should be identified in the proposal.

Proposals must also identify a single Project Manager (PM) who will oversee the technical and programmatic implementation of the project. The PM must work closely with the PI in order to ensure that the mission meets its objectives within the resources outlined in the proposal. The role, qualifications, and experience of the PM must be commensurate with the technical and managerial needs of the investigation. The respective roles of the PI and PM must be clearly defined. Commitment and past performance of the PM and his/her implementing institution will be important factors in selection of a Mars Scout investigation." Section 8.2.4

Feasibility of the Mission Implementation, Including Cost Risk

"The commitment of every partner, U.S. or non-U.S., offering a contribution must be documented in Letters of Commitment. For proposals offering contributions that are critical to the success of the proposed investigation, the evaluated risk will increase if the proposals: 1) do not have clear and simple technical and management interfaces in the proposed cooperative arrangements, 2) do not provide evidence in the proposal that the contribution is within the scientific and technical capability of the partner, and 3) do not have the required commitment to provide the offered contribution. Adequate contingency plans for coping with the failure of a proposed cooperative arrangement may help to reduce the evaluated risk. (See Appendix B, Sections J.2, J.3, and J.4 for required appendices for contributed goods and services.)

Since MoO investigations fly on non-MEP missions, factors involving spacecraft and launch vehicle capabilities will be considered in the evaluation only as appropriate. For both Mission and MoO investigations, technical, management, and cost evaluation will include an assessment of proposed planetary protection provisions to avoid potential biological contamination (forward and backward) that may be associated with the mission."
Section 8.2.4

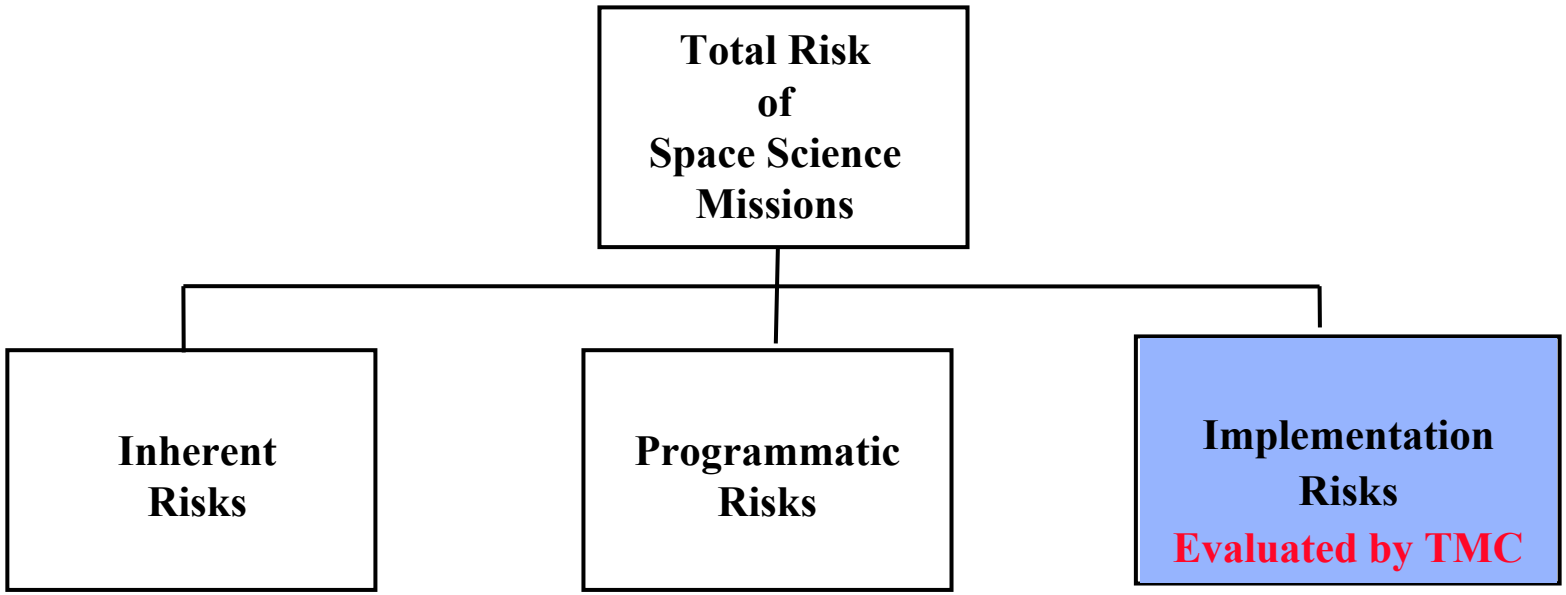
Appendix B - Guidelines for Proposal Preparation

- Appendix B provides instructions on what information must or should be provided.
  "This Appendix uses the term "must" to specify information that is required for the government to complete an evaluation of the implementation risk for each proposal. If this information is not provided, a weakness may be noted in the evaluation."
- Specific Topics areas with page limits are described in Table on B-2 and Appendix B text.
  - Discuss the Small Disadvantage Business (SDB) subcontracting plan- Appendix B Sec E
    - Within the page limit (see chart in this Appendix) and consistent with the specific guidance given in Sections 6.9 of this AO and Paragraph XIII of Appendix A, respectively, discuss the proposed Small Business Plan.
  - Proposals must provide the information requested in Appendix B and must be compliant with all constraints, guidelines and requirements in AO.
- If there is a conflict between AO and Appendix B and or Library documents, the AO takes precedence.
- Some material in Appendix B is optional such as Appendix J Item 13 Proposal Team Cost Data
  In addition to the specific cost table data requested in the Cost Proposal, Section J, proposers should also provide any additional costing information/data which they feel will assist the evaluation team to validate the project's proposed costs. Vendor quotes, cost estimates, rationale for design heritage cost savings, are all examples of data that can be included here.

Other Sources of Information - AO and Library Documents

- Other required information is described in AO.
  - " Each proposal must verify that they will obtain IV&V services from this NASA Facility." AO section 6.3.1
    - Discuss in proposal - no letter required.
- Specific Information can be obtained from contacts in Library documents.
  - NASA's Mission Operations and Communications Services
    - Provide a preliminary DSMS Service Agreement (DSA) with proposal. (if using DSMS services).
    - Provide a preliminary Project Support Level Agreement (PLSA) with proposal (if using GN or SN services)
    - Contacts are provided in document.

Risks for Space Science Missions



Risks that are unavoidable to do the investigation:

- Launch environments
- Space environments
- Unknowns
- Etc.

Risks that are uncertainties due to matters beyond project control:

- Environmental Assessment approvals
- Budgetary uncertainties
- Political impacts
- Etc.

Risks that are associated with implementing the investigation:

- Adequacy of planning
- Adequacy of management
- Adequacy of development approach
- Adequacy of schedule
- Adequacy of funding
- Adequacy of Risk Management (planning for known & unknown)

TMC Evaluation Objective

- **The TMC evaluation is to determine, for each Proposal, the level of risk of accomplishing the scientific objectives of the investigation, as proposed, on time and within cost.**
- **There are three possible Risk Levels: Low, Medium, and High**
  - **Low Risk:** There are no problems in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation.
  - **Medium Risk:** Problems have been identified, but are considered within the proposal team's capabilities to correct with good management and application of effective engineering resources. Mission design may be complex and resources tight.
  - **High Risk:** Problems are of sufficient magnitude such that failure is highly probable.

TMC Principles for Evaluation

- **Basic Assumption**: Proposer is the expert on his/her proposal.
  - **TMC:** Task is to try to validate proposer's assertion of Low Risk.
  - **Proposer:** Task is to provide evidence that the project is Low Risk.
- **All Proposals will be reviewed to identical standards.**
  - Science Support Office established in 1996 by OSS to support Discovery and Explorer, now also supports New Frontiers, Mars Scout, and others.
  - The TMC process is used by SSO to support all SMD evaluations with a standard process.
  - All proposals receive same evaluation treatment in all areas.
- **TMC Panel is made up of evaluators that are experts in the areas of the proposals that they evaluate.**
- **TMC Panel develops findings for each proposal that is the consensus of the entire TMC panel.**
  - Findings: As expected (no finding), above expectations (strengths), below expectations (weaknesses).

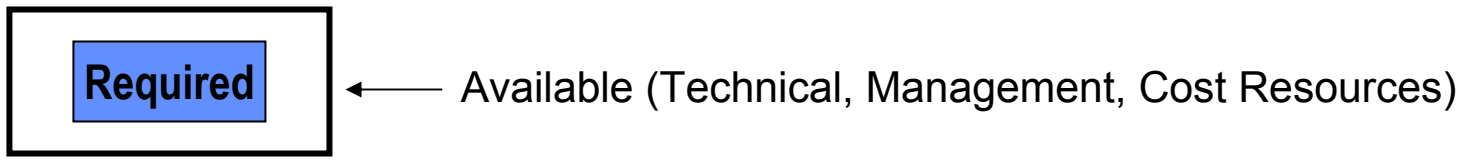
TMC Principles for Evaluation

- **Step One Proposal Risk Assessment:**
  - The TMC Risk Assessment is based on a *preliminary concept* with appropriate benefit of the doubt given to the Proposer.
  - The Cost Analysis is done without Proposer feedback and is integrated into overall risk.
- The final TMC evaluation product is a Form C with a Risk Rating as either Low, Medium, or High Risk.
- Only Major Strengths and Major Weaknesses are considered in determining the overall Form C Risk Rating.

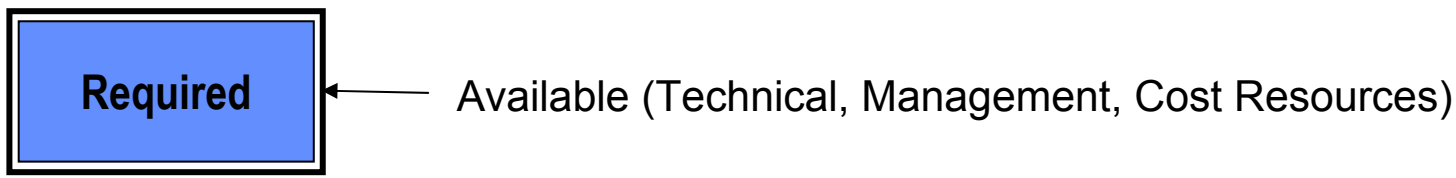
TMC Envelope Concept

Envelope: All TMC Resources available to handle known and unknown development problems that occur. Includes schedule and funding reserves; reserves and margins on physical resources such as mass, power, and data; descope options; fallback plans; and personnel.

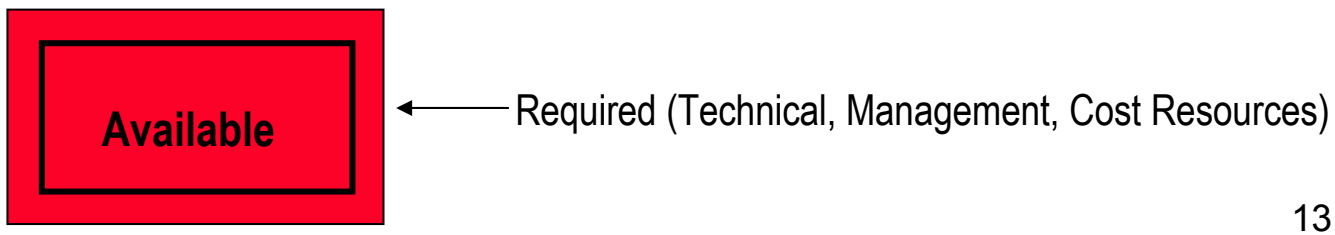
Low Risk: Required resources fit well within available resources



Medium Risk: Required resources just barely inside available resources. Tight, but likely doable



High Risk: Required resources DO NOT fit inside available resources. Expect project to fail



TMC Evaluation Factors and Sub-Factors Mars Scout Mission Investigation Proposals

Generally, the degree to which Proposals address the following factors directly relates to the grade of Low, Medium, or High Risk:

- **Instrument**
  - Instrument Design, Accommodation, and Interface
  - Design Heritage
  - Environment Concerns
  - Technology Readiness
  - Instrument Systems Engineering
- **Mission Design and Operations (N/A for MO's)**
  - Mass Margins
  - Trajectory Analysis
  - Launch Services
  - Concept of Mission Operations
  - Ground Facilities – New/Existing
  - Telecom
- **Flight Systems**
  - Hardware/Software Design
  - Design Heritage
  - Spacecraft Systems Design
  - Design Margins (Excluding mass)
  - Qualification and Verification
  - Assembly, Test, and Launch Operations
  - Mission Assurance
  - Development of New Technology
- **Management and Schedule**
  - Roles and Responsibilities
  - Team Experience and Key Individuals Qualification
  - Project Management and Systems Engineering
  - Organizational Structure and Work Breakdown Schedule (WBS)
  - International Participation
  - Risk Management, Including Descope Plan and Decision Milestones
  - Project-Level Schedule
  - Proposed Subcontracting Plans and SDB Participation.
- **Cost**
  - Basis of Estimate (BOE)
  - Cost Realism and Completeness
  - Cost Reserves by Phase
  - Comparison with TMC Estimates (Including
  - Parametric Models/Analogies)

Cost Evaluation

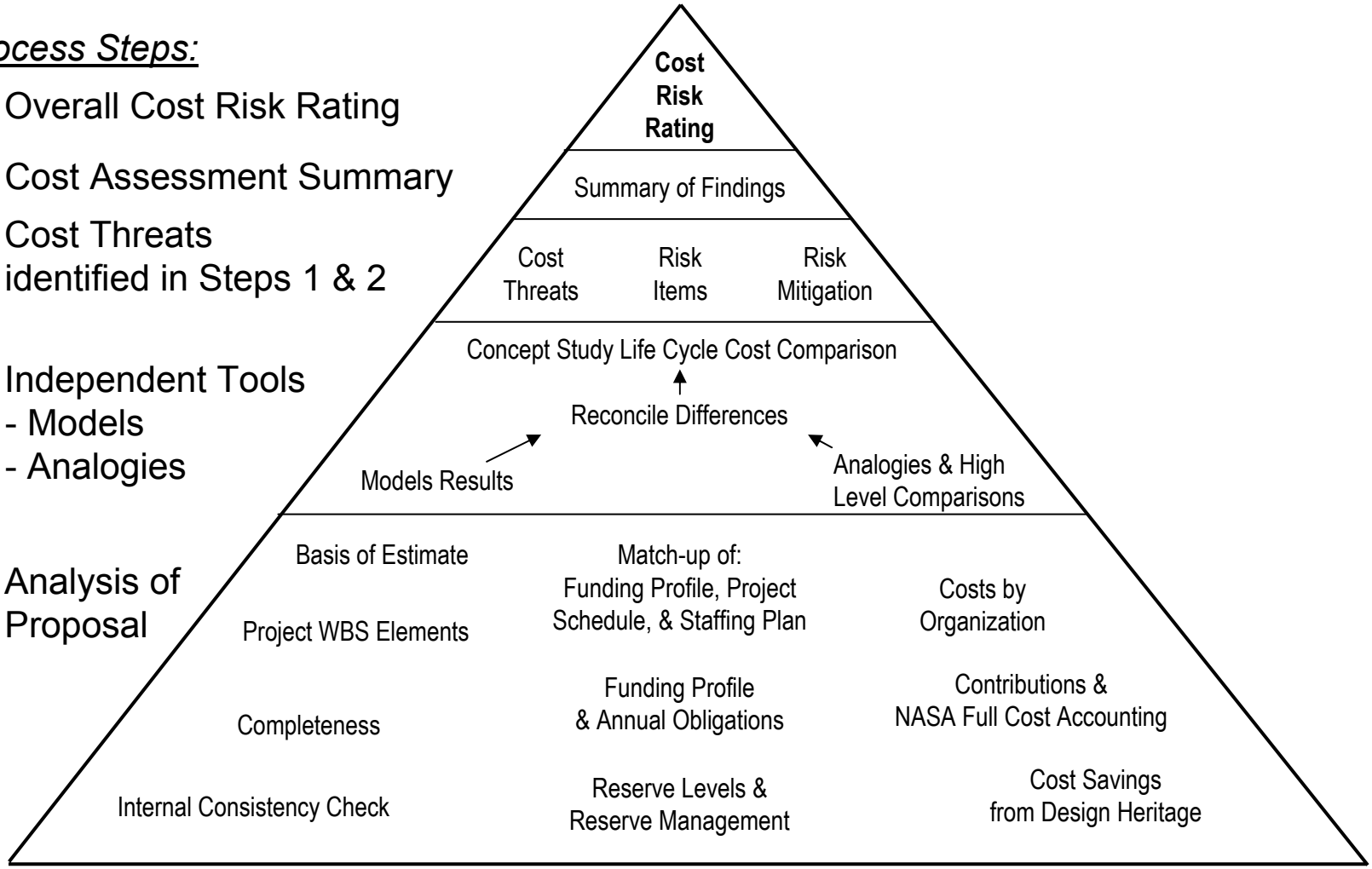
- Cost evaluation of Full Missions and MO's will be accomplished using the same methodology.
- Cost analysis is accomplished based on information in the proposals (consistency, completeness, proposed basis of estimate, contributions, use of full cost accounting, maintenance of reserve levels, and cost management, etc.).
- Cost Realism is based on Models, Analogies, Heritage, and Grass Roots information in the proposals.
- Several independent cost models are used to analyze proposed cost.
- The cost threats, risks, and risk mitigation analysis will be analyzed.
- Entire TMC Panel will participate in Cost deliberations and works to achieve consensus for Cost Risk.
- Cost Risk is reported in one of the following 5 categories: 1) Low Risk, 2) Medium-Low Risk, 3) Medium Risk, 4) Medium-High Risk, and 5) High Risk.
- The Cost Assessment and Cost Risk are folded into the overall TMC Assessment and TMC Risk.

TMC Independent Cost Assessment Pyramid

"The Pyramid"

Process Steps:

5. Overall Cost Risk Rating
4. Cost Assessment Summary
3. Cost Threats identified in Steps 1 & 2
2. Independent Tools
   - Models
   - Analogies
1. Analysis of Proposal



Typical TMC Evaluation Questions to be Answered

- Will overall investigation approach allow successful implementation as proposed?
- If not, are there sufficient resources (time & $) to correct identified problems?
- Does proposed design/development allow the investigation to have a reasonable probability of accomplishing its objectives and include all needed tools?
- Are requirements within existing capabilities or are advances required?
- Does the proposal accommodate sufficient resiliency in appropriate resources (e.g., money, mass, power) to accommodate development uncertainties?
- Is there a Risk Management approach adequate to identify problems with sufficient warning to allow for mitigation without impacting the investigation's objectives?
- Does the proposer understand the known risks and are there adequate fallback plans to mitigate them, including risk of using new developments, to assure that investigation can be completed as proposed?

Typical TMC Evaluation Questions to be Answered (cont'd)

- Is the schedule doable?
- Does it reflect an understanding of work to be done and time it takes to do it?
- Is there a reasonable probability of delivering the investigation on time to meet Mars Scout Project Schedules?
- Does it include schedule margin?
- Will proposed management approach (e.g., institutions and personnel, as known, organization, roles and responsibilities, experience, commitment, performance measurement tools, decision process, etc) allow successful completion of investigation? Is the role, qualifications, and experience of the PM commensurate with the technical and managerial needs of the investigation?
- Does the investigation, as proposed, have a reasonable chance of being accomplished within proposed cost?
- Are proposed costs within appropriate caps and profiles and does cost estimate cover all costs including full-cost accounting for NASA Centers?
- Are costs phased reasonably?
- Is there evidence in the proposal to give confidence in the proposed cost?
- Does the proposer recognize all potential risks/threats for additional costs or cost growth (e.g., late deliveries of components)?

Some Characteristics Applicable to a Low Risk Rating

- All risks for the project have been/are being identified and managed by the team, with plans to reduce or retire the risk before launch.
- No risk exists for which there is neither a workaround planned, nor a very sound plan to develop and qualify the risk item for flight.
- The proposed project team and each of its critical participants are competent, qualified, and committed to execute the project.
- The project will be self managed to a successful conclusion while providing reasonable visibility to NASA for oversight.
- The team has thoroughly analyzed all project requirements, and the resulting resources proposed are adequate to cover the projected needs, including an additional percentage for growth during the design and development, and then a margin on top of that for unforeseen difficulties.
- Reserve time exists in the schedule to find and fix problems if things do not go according to plan.
- Any contributed assets for the project are backed by letters of commitment.
- The team understands the seriousness of failing to meet technical, schedule, or cost commitments for the project in today's environment.

•Presentation and a Paper on Technical, Management, and Cost Review Lessons Leaned
Is available at http://science.hq.nasa.gov/research/041106-agenda.html
And through the Mars Scout Acquisition page at
http://mars-scout.larc.nasa.gov/

•Recommend reviewing Common Causes of Major Weaknesses.

•Note: Mars Scout Acquisition pages will be offline Thursday, May 18, 2006 7am to 8am Eastern